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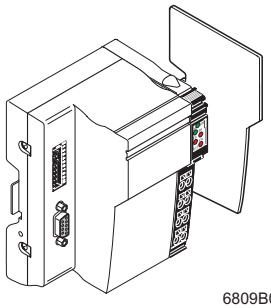
IL PB BK DP/V1
IL PB BK DP/V1-PAC

PROFIBUS DP/V1 Bus Coupler



6809B001

Data Sheet 10/2004

The product versions IL PB BK DP/V1 and IL PB BK DP/V1-PAC only differ in the scope of supply (see "Ordering Data" on page 15). Their function and technical data are identical.
For greater clarity, only the order designation IL PB BK DP/V1 is used throughout this document.

This data sheet is only valid in association with the IL PB BK DP/V1 UM E User Manual. You will find a list of operable I/O terminals and information on their address area in the User References Order No. 90 15 35 8 and Order No. 90 18 48 1, see "Ordering Data for Documentation" on page 16.

Function

The PROFIBUS-DP/V1 bus coupler is the link between PROFIBUS-DP and the Inline installation system.

Inline terminals and Loop 2 modules can be connected in any order to an existing PROFIBUS-DP using the PROFIBUS-DP/V1 bus coupler. In this way, all the advantages of the installation system created using these terminals can also be used on PROFIBUS-DP.

Features

The PROFIBUS-DP/V1 bus coupler has the following properties:
(*) new functions in the IL PB BK-compatible mode

- A maximum of 63 Inline devices or Loop 2 modules can be connected to PROFIBUS-DP via the bus coupler. The PROFIBUS-DP/V1 bus coupler and the Inline terminals create a station.
- The total of all input and output data of the connected terminals must not exceed 176 bytes per station in the IL PB BK DP/V1 mode (DIP switch 8 = ON). (184 bytes, maximum in IL PB BK mode DIP switch 8 = OFF)
- DP/V1 for Class 1 and Class 2 masters
- Acyclic communication with, e.g., RS-232 modules also in the process data channel (*)
- I/O terminal parameterization
- Fail-safe values
- Various diagnostic formats
- Acknowledgment of I/O errors from the user program (*)
- Adaptation of the high byte/low byte format in 16-channel input and output modules to the control system format (*)
- The bus coupler can be installed with a data transmission speed of 9.6 kbit/s to 12 Mbit/s. The bus coupler is automatically set to the speed specified by the PROFIBUS master.

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– The operating voltage of the IL PB BK DP/V1 bus coupler is 24 V DC. The operating temperature range is 0°C to +55°C (+32°F to +131°F).
– Diagnostics is provided locally by LEDs on the bus coupler, and on the Inline terminals and Loop 2 modules. All diagnostic information can be forwarded to the PROFIBUS master via PROFIBUS.

The PROFIBUS-DP/V1 bus coupler Firmware version B and later has been expanded by the dynamic configuration. This includes the specification and configuration of a maximum configuration. Any subgroup of this maximum configuration may be operated. In addition to the dynamic configuration, empty spaces may be reserved for future expansions.

The intelligent wiring method used in the Inline terminals and Loop 2 modules enables the stations to be constructed quickly and easily because, for example, there is no need for time-consuming wiring of terminal power supplies. In the simplest case, it is only necessary for the power supply units integrated in the PROFIBUS-DP/V1 bus coupler to be supplied with 24 V DC. They then generate the operating voltage required for the PROFIBUS-DP/V1 bus coupler and the connected Inline terminals.

DIP switch 8 is particularly important, see page 7. As default upon delivery, it is in the "OFF" position. This means that the device can directly replace the previous version IL PB BK (Order No. 27 40 05 4) although it also offers some new functions, see above (*). However, these functions can only be used on the new devices. When configuring the device, use the "PXC_00F0.GSD" GSD and the "IL PB BK DP/V1 (DIP 8 = OFF)" device entry in the hardware list.

In the "ON" position the device offers all the functions mentioned above and has a new PROFIBUS ID number. Use the "PXC_06CC.GSD" GSD and the "IL PB BK DP/V1 (DIP8 = ON)" device entry in the hardware list for configuring and para-meterizing the device. The stop response, which was specified by this switch in the old device, is then set in the parameterization.

An up-to-date device database file (GSD) can be downloaded from the Internet at www.phoenixcontact.com.

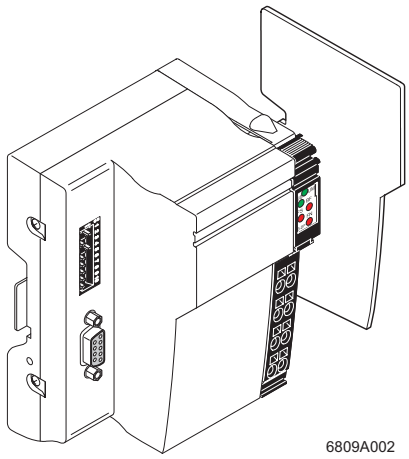

Figure 1 Bus coupler with connector and end plate

The end plate is supplied with the PROFIBUS-DP/V1 bus coupler. Place this plate at the end of the Inline station. The end plate does not have any electrical function. It protects the station against ESD pulses and the user against dangerous contact voltage.

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Overview on Firmware Functions

PROFIBUS	IL PB BK (-PAC) Order No.: PAC: 28 62 30 1 Order No.: 27 40 05 4	IL PB BK DP/V1 (-PAC) Order No. PAC: 28 62 24 6 Order No.: 27 18 68 8	
		DP/V0 mode	DP/V1 mode
Can be replaced with IL PB BK	x	x	–
Support of DP/V0 (cyclical communication)	Process data, 184 bytes, maximum	Process data, 184 bytes, maximum	Process data, 176 bytes, maximum
PCP module operation	–	x	x
Supporting DP/V1 read and write (acyclic communication), Class-1 and Class-2 master	–	–	x
Communication using PCP modules via "normal" process data (DP/V0)	–	x	x
Parameterization of many I/Os via dialogs in the configuration tool	–	–	x
Presetting replacement values via the configuration tool	–	–	x
Turning the byte for IB IL 24 DI 16 and IB IL 24 DO 16 for adaptation to the control format	–	x	x
Turning the byte for IB IL 24 DI 32 and IB IL 24 DO 32	–	New for Firmware B or later	New for Firmware B or later
Acknowledging bus stops either automatically or via the application program	–	x	x
Acknowledging bus stops either automatically or via the application program	–	x	x
Diagnostics in the IL PB BK format	x	x	x
Diagnostics in the identification format	–	–	x
Diagnostics as status PDU	–	–	x
Stopping behavior adjustable via DIP switch	x	–	–

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PROFIBUS	IL PB BK (-PAC) Order No.: PAC: 28 62 30 1 Order No.: 27 40 05 4	IL PB BK DP/V1 (-PAC) Order No. PAC: 28 62 24 6 Order No.: 27 18 68 8	
		DP/V0 mode	DP/V1 mode
Stopping behavior adjustable via parameter telegram	–	x	x
Transmission invoke ID (for example for IB IL POS 200)	–	New for Firmware B or later	New for Firmware B or later
Dynamic configuration (Reserving I/Os in the PLC e.g. for easy expandability)	–	–	New for Firmware B or later
Freely assignable station IDs (2 bytes) for improved identification on the network	–	–	New for Firmware B or later
Presetting fail-safe values via the configuration tool	–	–	x
Fail-safe values also without connection to the PLC	–	–	New for Firmware B or later
Improved diagnostics of I/Os during startup	–	–	New for Firmware B or later
Configuration can be stored (additional verification using the latest valid configuration)	–	–	New for Firmware B or later

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Connecting PROFIBUS

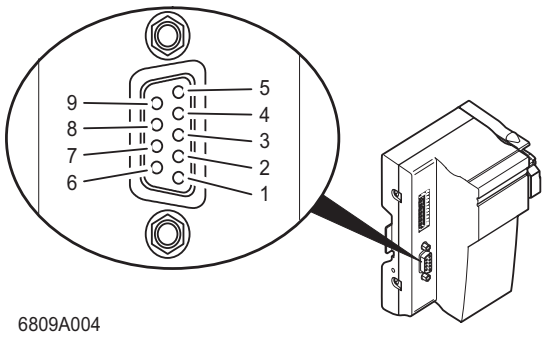

Figure 2 Pin assignment of the 9-pos. D-SUB female connector

Connect PROFIBUS to the PROFIBUS-DP/V1 bus coupler using a 9-pos. D-SUB connector (e.g., SUBCON-PLUS-PROFIB, Order No. 27 44 34 8). Please refer to the pin assignment in the following table:

Pin	Assignment
1	Reserved
2	Reserved
3	RxD/TxD-P (receive/transmit data +), cable B
4	CNTR-P (control signal for repeater), direction control
5	DGND (reference potential up to 5 V)
6	VP (supply voltage +5 V for termination resistors)
7	Reserved
8	RxD/TxD-N (receive/transmit data –), cable A
9	Reserved

Mains Termination Resistors

Since PROFIBUS-DP is a serial bus system in a line or tree structure, the individual branches must be terminated using a termination resistor. The PROFIBUS-DP/V1 bus coupler does not have a resistor of this type. For additional information, please refer to your PROFIBUS documents. Phoenix Contact recommends using the PROFIBUS connector SUBCON-PLUS-PROFIB, Order No. 27 44 34 8. This connector has a termination resistor that can be connected.

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Supplying Operating Voltages

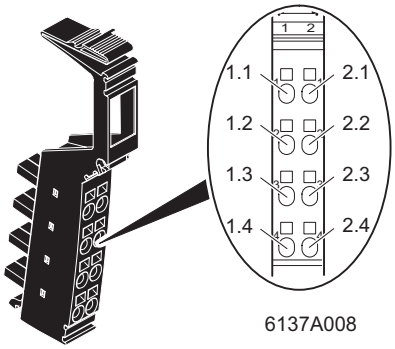

Figure 3 Terminal assignment for the PROFIBUS-DP/V1 bus coupler power connector

Terminal Points	Remark
1.1, 2.1	Segment supply (+24 V DC)
1.2, 2.2	Main supply, bus coupler supply, communications power, and interface supply (+24 V DC)
1.3, 2.3	Reference potential
1.4, 2.4	Functional earth ground (FE)

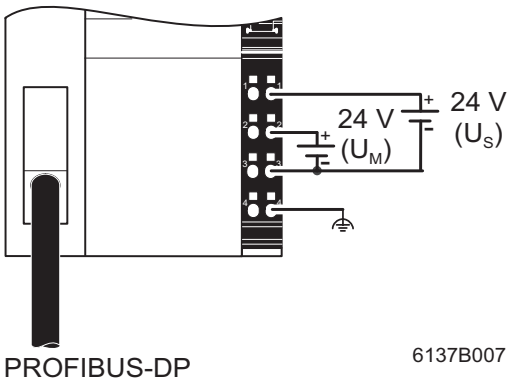

Figure 4 Connection wiring plan for the PROFIBUS-DP/V1 bus coupler

Connect the PROFIBUS-DP/V1 bus coupler according to Figure 4.

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Hardware Configuration

Configure the hardware on the PROFIBUS-DP/V1 bus coupler using the 10-pos. DIP switch. The PROFIBUS address and other PROFIBUS-DP/V1 bus coupler settings can be set using this switch. The meaning of the switches is given in the following table.

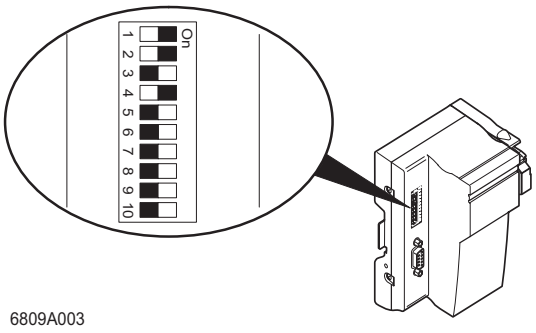

Figure 5 PROFIBUS-DP/V1 bus coupler DIP switches

DIP switches	Meaning
1 - 7	PROFIBUS address in binary format (0 - 127 in decimal format) Switch 1 defines the least significant bit (2^0) and switch 7 defines the most significant bit (2^6).
8	Inline station operating mode: ON = DP/V1 mode with acyclic communication, parameterization, fail-safe values, etc. OFF = Can directly replace the previous version IL PB BK (Order No. 27 40 05 4)
9 - 10	Reserved; both switches **must** be in the "OFF" position.

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Local Diagnostic Indicators

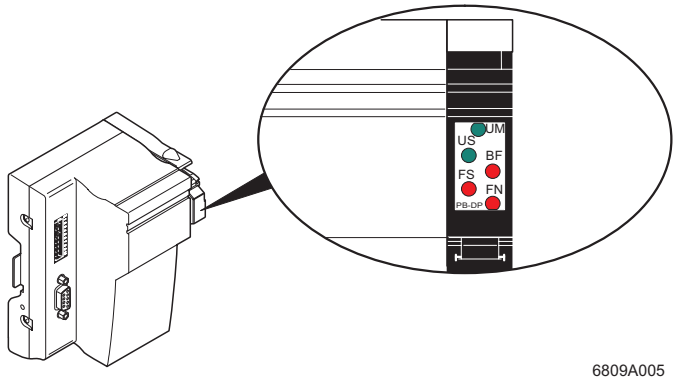

Figure 6 Indicators on the PROFIBUS-DP/V1 bus coupler

LED	Color	Meaning	State	Description of the LED States
UM	Green	$\mathbf{U}_{\text{Main}}$	ON	24 V main circuit supply present
			OFF	Main circuit supply not present
US	Green	$\mathbf{U}_{\text{Segment}}$	ON	24 V segment supply present
			OFF	Segment supply not present
BF	Red	**B**us **F**ault	ON	No communication on PROFIBUS
			OFF	No error
			Flashing	PLC stopped Fail-safe values are output.
FS	Red	**F**ailure **S**elect	ON	If FS is on, FN indicates the error type.
			OFF	If FS is not on, FN indicates the error number.
FN	Red	**F**ailure **N**umber	Flashing	The number of flashing pulses indicates the error type or the error number, depending on whether FS is on or not.
			OFF	No error

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Circuit Diagram

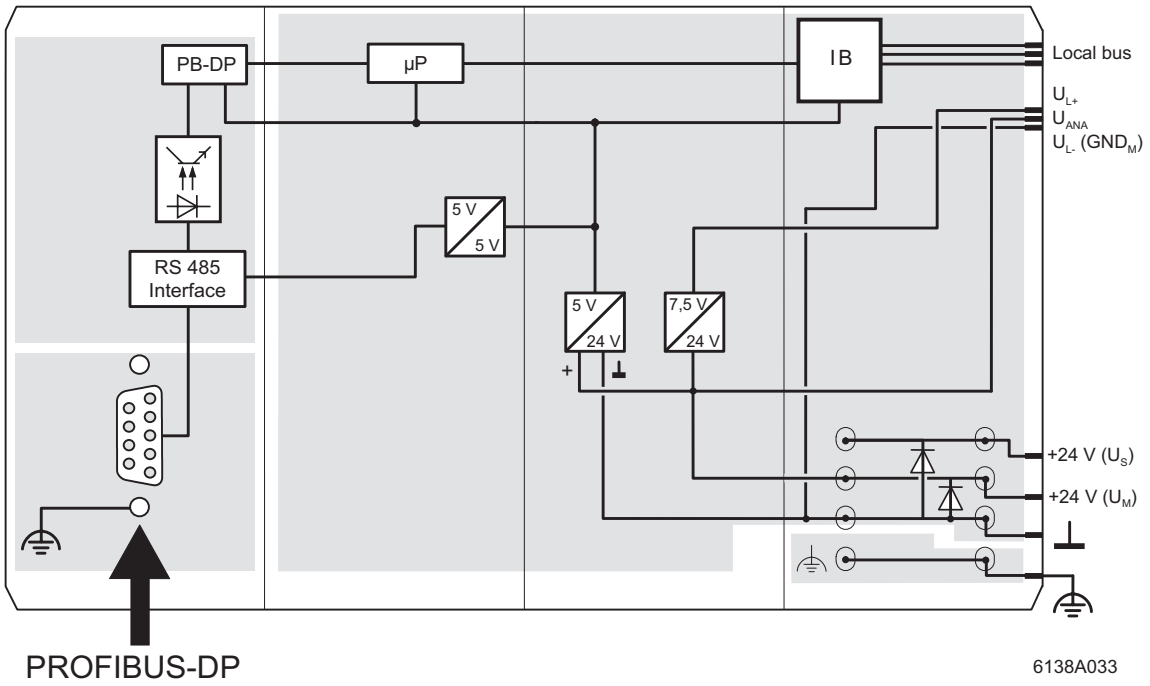

Figure 7 Circuit diagram of the PROFIBUS DP/V1 bus coupler

Key:

PB-DP	Protocol chip
µP	Microprocessor
IB	Protocol chip
	Optocoupler
	Power supply unit with electrical isolation
RS 485 Interface	RS-485 interface

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Standard and Device-Related Diagnostics for PROFIBUS

Error Type	Meaning
1	**Parameter error on PROFIBUS (SET_PRM telegram)**
2	**Configuration error on PROFIBUS (CHK_CFG telegram)**
	Detailed information about the PROFIBUS configuration error is represented by 14 different error numbers.
3	**Configuration error in the Inline station**
	Detailed information about the Inline station configuration error is represented by eight different error numbers.
4	**INTERBUS error within the station**
	Detailed information about the INTERBUS error within the station is represented by six different error numbers.
5	**Module error**
6	**Parameter error on the local bus**
7	**EEPROM error**
More detailed information about error causes and remedies can be found in the user manual, see "Ordering Data for Documentation" on page 16.	

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Technical Data

General Data		
Order designation (Order No.)	IL PB BK DP/V1-PAC IL PB BK DP/V1	(28 62 24 6) (27 18 68 8)
Housing dimensions (width, including latching x height x depth)	91 mm x 120 mm x 71.5 mm (3.583 in. x 4.724 in. x 2.815 in.)	
Weight	210 g (without connectors)	
Degree of protection	IP20 according to IEC 60529	
Class of protection	Class 3, according to VDE 0106, IEC 60536	

System Data	
Number of devices per station	63, maximum
Sum of all I/O data per station	184 bytes, maximum in IL PB BK mode 176 bytes, maximum in IL PB BK DP/V1 mode
Maximum bus coupler current for supplying the I/O terminal logic	2 A at U_L
Maximum current for supplying the analog terminals	0.5 A at U_{ANA}

PROFIBUS-DP Interface
Copper cable (RS-485), connected via D-SUB shield connector; electrically isolated supply, shielding directly connected to functional earth ground

24 V Main Supply U_M (Main Supply, Bus Coupler Supply, Communications Power, and Interface Supply)	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; routing cables through outdoor areas is not permissible
Voltage continuation	Through potential routing
Nominal value	24 V DC
Tolerance	-15% / +20% (according to EN 61131-2)
Ripple	±5%
Permissible range	19.2 V to 30 V (ripple included)

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24 V Main Supply U_M (Main Supply, Bus Coupler Supply, Communications Power, and Interface Supply) (Continued)	
Minimum current consumption at nominal voltage	0.1 A DC (no-load operation, i.e., incoming PROFIBUS is plugged in, no Inline devices are connected)
Maximum current consumption at nominal voltage	1.25 A DC, consists of: 0.75 A DC for communications power 0.5 A DC for analog voltage supply
Safety measure	
Surge voltage	Yes
Polarity reversal	Yes

Provide an external fuse for the 24 V area

This 24 V area must be provided with an external fuse. The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

24 V Segment Supply U_S	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; routing cables through outdoor areas is not permissible
Voltage continuation	Through potential routing
Nominal value	24 V DC
Tolerance	-15% / +20% (according to EN 6113 1-2)
Ripple	±5%
Permissible range	19.2 V to 30 V (ripple included)
current carrying capacity	8 A, maximum
Safety measure	
Surge voltage	Yes
Polarity reversal	Yes

Provide an external fuse for the 24 V area

This 24 V area must be provided with an external fuse. The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

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Ambient Conditions	
Ambient temperature (operation)	0°C to +55°C (32°F to +131°F)
Ambient temperature (storage)	-25°C to +85°C (-13°F to +185°F)
Humidity (operation)	75% on average, 85% occasionally
In the range from 0°C to +55°C (32°F to 131°F) appropriate measures against increased humidity (>85%) must be taken.	
Humidity (storage)	75% on average, 85% occasionally
For a short period, slight condensation may appear on the outside of the housing if, for example, the terminal is brought into a closed room from a vehicle.	
Air pressure (operation)	80 kPa to 106 kPa (up to 2,000 m [6,562 ft.] above sea level)
Air pressure (storage/transport)	70 kPa to 106 kPa (up to 3,000 m [9,843 ft.] above sea level)

Mechanical Requirements	
Vibration test Sinusoidal vibrations according to IEC 60068-2-6; EN 60068-2-6	5g load, 2 hours in each space direction (24 V DC, 120 V AC, and 230 V AC areas) 2g load, 2 hours for each space direction (400 V AC area)
Shock test according to IEC 60068-2-27; EN 60068-2-27	25g load for 11 ms, half sinusoidal wave, three shocks in each space direction and orientation
Broadband noise according to IEC 60068-2-64; EN 60068-2-64	0.78g load, 2.5 hours in each space direction
Insertion/withdrawal cycles	
Terminal	10 cycles
Connector	10 cycles

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Conformance With EMC Directive 89/336/EEC		
Noise Immunity Test According to EN 61000-6-2		
Electrostatic discharge (ESD)	EN 61000-4-2/ IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3 IEC 61000-4-3	Criterion A Field strength: 10 V/m
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	Criterion A All interfaces: 1 kV Criterion B All interfaces: 2 kV
Surge voltage	EN 61000-4-5/ IEC 61000-4-5	Criterion B DC supply lines: 0.5 kV/1 kV (symmetrical/asymmetrical) Fieldbus cable shielding 1 kV
Conducted interference	EN 61000-4-6 IEC 61000-4-6	Criterion A Test voltage 10 V
Noise Emission Test According to EN 61000-6-4		
Noise emission of housing	EN 55011	Class A

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Ordering Data

Description	Order Designation	Order No.
PROFIBUS-DP/V1 bus coupler (with end plate, connector, and labeling field)	IL PB BK DP/V1-PAC	28 62 24 6
PROFIBUS-DP/V1 bus coupler (with end plate)	IL PB BK DP/V1	27 18 68 8
The power connectors listed below are also needed for the complete fitting of the IL PB BK DP/V1.		
Power connectors for the bus coupler pack of 10	IB IL SCN-PWR IN-CP	27 27 63 7
D-SUB connector, 9-pos. with two cable feeds for PROFIBUS up to 12 Mbit/s (terminal resistor can be connected using slide switch)	SUBCON-PLUS-PROFIB	27 44 34 8

Ordering Data for Accessories

Description	Order Designation	Order No.
Coding profile (100 pcs./package)	IL CP	27 42 68 3
Zack markers for labeling terminals	ZB 6 ... see "CLIPLINE" catalog	
DIN EN 50022 DIN rail, 2 meters (6.562 ft.)	NS 35/7,5, perforated NS 35/7,5, unperforated	08 01 73 3 08 01 68 1
End clamp	CLIPFIX 35	30 22 21 8
Universal ground terminal block	USLKG 5	04 41 50 4
Screwdriver according to DIN 5264, blade width 3.5 mm (9/64 in.)	SZF 1-0,6X3,5	12 04 51 7

Additional System Components

The PROFIBUS-DP/V1 bus coupler can only be supplemented by further system componentes from the product spectrum of Phoenix Contact:

– FO interface converters (INTERFACE catalog) for fiber optic data transmission;
– Power supply units ("INTERFACE" catalog) for supplying bus couplers

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Ordering Data for Documentation

Description	Order Designation	Order No.
Configuring and Installing the PROFIBUS-DP/V1 bus coupler for the Inline product range	IL PB BK DP/V1 UM E	26 98 10 6
User Reference: I/O terminals at bus couplers	AH IL BK IO LIST	90 15 35 8
Application note: To the address area of I/O terminals at the PROFIBUS DP/V1 bus coupler	AH IL PB BK DP/V1 (-PAC) - address area	90 18 48 1
User Manual: Automation Terminals of the Inline Product Range	IL SYS INST UM E	26 98 73 7
CD-ROM with all Inline, Loop 2, and other data sheets	CD IBS DB ELDOC	27 45 60 6

Make sure you always use the latest documentation. It is available for download at www.download.phoenixcontact.com.

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